

REMARKS

I. Introduction

For the reasons set forth below, Applicants respectfully submit that all pending claims are patentable over the cited prior art references.

II. The Rejection Of Claims 1, 4 and 6-8 Under 35 U.S.C. § 102

Claims 1, 4 and 6-8 were rejected under 35 U.S.C. § 102(b) as being anticipated over Yamashita et al. (USP No. 6,287,720). Applicants respectfully traverse this rejection for at least the following reasons.

With regard to the present invention, claim 1 recites, in-part, a lithium secondary battery comprising: a positive electrode comprising a composite lithium oxide; a negative electrode comprising a material capable of absorbing and desorbing lithium; a separator interposed between said positive electrode and said negative electrode; and a non-aqueous electrolyte, wherein said separator comprises non-woven fabric.

In contrast to the present invention, Yamashita does not disclose a separator comprised of non-woven fabric. Nor does the Office Action explicitly state that Yamashita discloses this limitation. There is mention that the separator 13B of Yamashita is made of polyethylene in Example 6 (see, col. 30, lines 63-66) and that the second layer of the separator acts as a porous film made of insulating substance. However, the material disclosed in Example 6 is not equivalent to the non-woven fabric used in the separator of the present invention. As is disclosed in col. 29, line 55 to col. 30, line 8 of Yamashita, separator 13A was formed from Al₂O₃ and particles of PVDF combined with NMP and separator 13B is fabricated from a slurry of particles of polyethylene and carboxymethyl cellulose. Thus, the polyethylene, being in particulate form,

is completely different from non-woven fabric, which is produced by combining pieces of small fabric portions without interlacing them. Furthermore, the Examiner alleges that Yamashita likens polyethylene to polypropylene. However, this is in contrast to the discussion of the *porous film materials*, not the non-woven fabric (see, Yamashita, col. 7, lines 40-46). Thus, Yamashita is completely silent with regard to using a non-woven fabric.

Typically, non-woven fabric is poor in mechanical strength. The present invention combines a porous film with a non-woven fabric to provide a separator with increased strength characteristics and reduced possibility of short-circuit. The combination used in the present invention provides for improved battery characteristics as compared to the use of a microporous film. In general, a microporous film made of a sheet-like shaped resin material is used as a separator for lithium secondary batteries. The microporous film is typically produced by drawing a sheet that is obtained by a molding method, such as extrusion. However, as discussed in paragraphs [0003]-[0004] of the specification, the problem with the microporous film is that its porosity is usually low and its capability of retaining non-aqueous electrolyte is low. As a result, the battery internal resistance tends to rise and the electrodes become thicker due to expansion and contraction of the active materials during repeated charge and discharge of the battery. This leads to electrolyte depletion in the microporous film because of the low electrolyte retention capability and a sufficient amount of non-aqueous electrolyte to the electrodes fails to be supplied. This results in a reduced capacity of the battery. As such, the use of the separator of the present invention that combines a non-woven fabric with a porous film results in a synergistic effect that produces a battery with excellent performance over that of a conventional microporous film.

As anticipation under 35 U.S.C. § 102 requires that each element of the claim in issue be found, either expressly described or under principles of inherency, in a single prior art reference, *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 USPQ 781 (Fed. Cir. 1983), and at a minimum, Yamashita does not disclose a lithium secondary battery comprising: a positive electrode comprising a composite lithium oxide; a negative electrode comprising a material capable of absorbing and desorbing lithium; a separator interposed between said positive electrode and said negative electrode; and a non-aqueous electrolyte, wherein said separator comprises non-woven fabric, it is clear that Yamashita does not anticipate claim 1, or any claim dependent thereon.

III. All Dependent Claims Are Allowable Because The Independent Claim From Which They Depend Is Allowable

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as claim 1 is patentable for the reasons set forth above, it is respectfully submitted that all pending dependent claims are also in condition for allowance.

IV. Conclusion

Having responded to all open issues set forth in the Office Action, it is respectfully submitted that all claims are in condition for allowance.

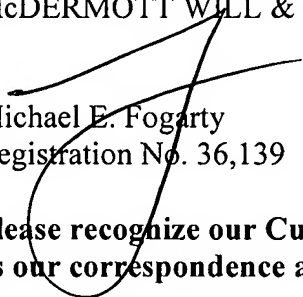
To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper,

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including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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